Title (en)

Fuzzy logic method for an indirect measure of a physical signal to be monitored, and corresponding measuring device

Title (de)

Fuzzy-Logikverfahren zur indirekten Messung von überwachten physischen Signalen und entsprechende Messvorrichtung

Title (fr)

Méthode à logique floue pour une mésure indirecte d'un signal physique surveillé et un dispositif de mésure correspondant

Publication

EP 0917069 A1 19990519 (EN)

Application

EP 97830611 A 19971118

Priority

EP 97830611 A 19971118

Abstract (en)

The invention relates to a method for an indirect measure, by the application of fuzzy logic rules, of a physical signal (G1) to be monitored which would be difficult to measure by a direct method and which has at least first (PD) and second (PS) significant values, these significant values (PD,PS) splitting said physical signal (G1) to be monitored time-wise into a first operational zone (Z1) corresponding to values below the first significant value (PD), a second operational zone (Z2) corresponding to values between the first (PD) and second (PS) significant values, and a third operational zone (Z3) corresponding to values above the second significant value (PS), only said second operational zone (Z2) being involved by the presence of a periodic index signal related to the physical signal (G1) to be monitored. The measuring method of this invention comprises the steps of: obtaining a derived physical signal (G2) from the physical signal (G1) to be monitored, this derived physical signal (G2) having a similar behavior as said physical signal (G1) to be monitored but trivial influence thereon and being related to said periodic index signal; measuring the value (P) of the derived physical signal (G2) and its variations over time at suitably selected check points (CP1,CP2,CP3,...,CPn); deriving the presence or absence of the periodic index signal by means of a first set (FUZZY1) of fuzzy rules; measuring the second (PS) and first (PD) significant values of the physical signal (G1) to be monitored as start and end values, respectively, of the second operational zone (Z2), namely as values which correspond to the start and end of the detection of the periodic index signal presence. The invention also relates to an apparatus for an indirect measure, by the application of fuzzy logic rules, of a physical signal (G1) to be monitored which would be difficult to measure by a direct method, of a type which comprises a compressor block (2) having a first input (3) connected to an input actuator block (5), a first output (4) connected to an output transducer block (7), and a second output (14) connected to a detector block (12), the input actuator block (5), output transducer block (7) and detector block (12) being connected to a fuzzy controller (24). The measuring apparatus of this invention further comprises a secondary exhaust block (9) connected to the compressor block (2) and effective to produce a derived physical signal (G2) behaving similar as the physical signal to be monitored (G1) but having a trivial influence thereon, and being related to the periodic index signal. The fuzzy controller (24) of the measuring apparatus according to the invention ultimately measures the first and second significant values (PD,PS) of the physical signal (G1) to be monitored by acting on the derived physical signal (G2). The indirect measuring method and apparatus of this invention can be applied in particular to the non-invasive reading of blood pressure and heart beat frequency. <IMAGE>

IPC 1-7

G06F 17/00; A61B 5/02

IPC 8 full level

G01D 21/00 (2006.01); **A61B 5/022** (2006.01); **G06F 9/44** (2006.01); **G06F 17/10** (2006.01); **G06N 7/02** (2006.01); A61B 5/024 (2006.01)

CPC (source: EP US)

A61B 5/022 (2013.01 - EP US); **A61B 5/7264** (2013.01 - EP US); A61B 5/024 (2013.01 - EP US); G16H 50/20 (2017.12 - EP); Y10S 128/92 (2013.01 - EP US)

Citation (applicant)

US 5156158 A 19921020 - SHIRASAKI OSAMU [JP]

Citation (search report)

- [A] US 4592365 A 19860603 - GEORGI HEINZ W [US]
- [A] HEE-SEUNG KANG ET AL: "A study on the improvement of correctness of the electro-sphygmomanometer using fuzzy logic", FUZZY ENGINEERING TOWARD HUMAN FRIENDLY SYSTEMS, YOKOHAMA, JAPAN, 13-15 NOV. 1991, 1992, AMSTERDAM, NETHERLANDS, IOS PRESS, NETHERLANDS, pages 655 - 660, XP002063363
- [A] TORU MASUZAWA ET AL: "A CONTROL METHOD BASED ON RECOGNITION OF TIME SEQUENTIAL DATA TRANSITION-APPLICATION TO BLOOD PRESSURE CONTROL", SYSTEMS & COMPUTERS IN JAPAN, vol. 21, no. 12, 1 January 1990 (1990-01-01), pages 45 - 54, XP000227832
- [A] SAUTER D ET AL: "RECOGNITION OF K-COMPLEX IN SLEEP EEG USING A FUZZY C-MEANS ALGORITHM", VISUALIZATION, IMAGING, SIGNAL PROCESSING, MODELING, NEURAL NETWORK, SAN DIEGO, OCT. 28 - 31, 1993, vol. VOL. 1, no. CONF. 15, 28 October 1993 (1993-10-28), SZETO A;RANGARAJ M RANGAYYAN, pages 358/359, XP000436785
- [A] SEHMI A S ET AL: "KNOWLEDGE-BASED SYSTEMS FOR NEUROELECTRIC SIGNAL PROCESSING", IEE PROCEEDINGS: SCIENCE, MEASUREMENT AND TECHNOLOGY, vol. 141, no. 3, 1 May 1994 (1994-05-01), pages 215 - 223, XP000450644

Cited by

EP1142531A1; US6629930B2; WO2006050725A1; US10335240B2; US9743994B2; US9521957B2; US10368837B2; US10321890B2; US10470743B2; US10368830B2; US11445996B2; EP2336922A1

Designated contracting state (EPC)

DE FR GB IT

DOCDB simple family (publication)

EP 0917069 A1 19990519; **EP 0917069 B1 20041013**; DE 69731206 D1 20041118; JP H11264746 A 19990928; US 6165131 A 20001226

DOCDB simple family (application)

EP 97830611 A 19971118; DE 69731206 T 19971118; JP 32088698 A 19981111; US 19352798 A 19981117